

CLAIMS

1. A phase-change memory cell including between two electrical contacts (1, 2), a portion (3) in a memory material with an amorphous-crystalline phase-change and vice versa, as a stack with a central  
5 area (3.1) located between two outmost areas (3.2, 3.3) characterized in that an interface (3.21, 3.31), inert or quasi-inert from a physico-chemical point of view, is present between the so-called active central area (3.1) and each so-called passive outmost area (3.2,  
10 3.3), each passive outmost area (3.2, 3.3) being made in a material having a melting temperature higher than that of the material of the active central area (3.1).

2. The phase-change memory cell according  
15 to claim 1, characterized in that each passive outmost area (3.2, 3.3) is made in a material having a thermal conductivity less than or equal to that of the material of the electrical contact (1, 2) which is closest to it and/or to that of the material of the active central  
20 area (3.1).

3. The phase-change memory cell according to any of claims 1 or 2, characterized in that the passive outmost areas (3.2, 3.3) have in a crystalline  
25 phase, an electrical resistance less than or equal to that of the active central area (3.1) in a crystalline phase.

4. The phase-change memory cell according to any of claims 1 to 3, characterized in that each passive outmost area (3.2, 3.3) is made in a material promoting a phenomenon of formation of crystalline germs in the active central area (3.1) in proximity to the interface (3.21, 3.31).

5. The phase-change memory cell according to any of claims 1 to 4, characterized in that each passive outmost area (3.2, 3.3) is made in a material substantially of the same chemical nature but with a different composition, from those of the material of the active central area (3.1).

6. The phase-change memory cell according to claim 5, characterized in that the material of the active central area (3.1) includes between about 16% and 30% of tellurium and between about 84% and 70% of antimony, the material of each passive outmost area (3.2, 3.3) being antimony possibly mixed with tellurium with a percentage ranging up to about 2%, these percentages being atomic percentages.

7. The phase-change memory cell according to any of claims 1 to 4, characterized in that each passive outmost area (3.2, 3.3) is made in a material which is of a chemical nature different from that of the material of the active central area (3.1), this material having very low solubility in the material of the active central area (3.1).

8. The phase-change memory cell according to claim 7, characterized in that the material of the active central area (3.1) is  $\text{Ge}_2\text{Sb}_2\text{Te}_5$  and the material of each passive outmost area (3.2, 3.3) is GeN.

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9. The phase-change memory cell according to any of claims 1 to 8, characterized in that the passive outmost areas (3.2, 3.3) are made in a same material.

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10. The phase-change memory cell according to any of claims 1 to 9, characterized in that the active central area (3.1) is at least partially confined laterally by electrically insulating material (4).

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11. The phase-change memory cell according to any of claims 1 to 10, characterized in that at least one of the passive outmost areas (3.2, 3.3) laterally overlaps the active central area (3.1).

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12. The phase-change memory cell according to any of claims 1 to 11, characterized in that at least one of the passive outmost areas (3.2, 3.3) and the active central area (3.1) coincide laterally.

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13. The phase-change memory cell according to any of claims 1 to 12, characterized in that at least one of the passive outmost areas (3.2, 3.3) is bordered with electrically insulating material (5, 4).

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14. A memory characterized in that it includes a plurality of memory cells according to claims 1 to 13.

5           15. A method for making at least one phase-change memory cell including between a first and second electrical contact (1, 2), a portion (3) in a memory material with amorphous-crystalline phase-change and vice versa, with a central area (3.1) located  
10 between first and second outmost areas (3.2, 3.3), characterized in that it includes the following steps:

          a) making the first electrical contact (2) on a substrate,  
          b) making on the first electrical contact,  
15 the first so-called passive outmost area (3.2), the so-called active central area (3.1) and the second so-called passive outmost area (3.3), these areas (3.1, 3.2, 3.3) forming a stack (3) with an interface (3.21, 3.31), inert or quasi-inert from a physico-chemical  
20 point of view, between each passive outmost area (3.2, 3.3) and the active central area (3.1) which is more meltable than the passive outmost areas,

          c) achieving at least partial lateral confinement of at least the active central area (3.1)  
25 with an electrically insulating material (4),

          d) making the second electrical contact (1) on the stack (3).

          16. The method according to claim 15,  
30 characterized in that the electrically insulating

material (4) laterally also confines at least one of the passive outmost areas (3.2, 3.3).

17. The method according to claim 15,  
5 characterized in that the steps b) and c) comprise, after having made the first passive outmost area (3.2), the following operations:

- depositing the electrically insulating material (4) leading to the lateral confinement, on the  
10 first passive outmost area (3.2),
- excavating a well (4.1) in the electrically insulating material, this well having a bottom reaching the first passive outmost area (3.2),
- filling the well (4.1) with a layer  
15 leading to the active central area (3.1),
- making the second passive outmost area (3.3) above the well (4.1).

18. The method according to any of claims  
20 15 or 16, characterized in that the steps b) and c) include the following operations:

- depositing on the first electrical contact (2), a first layer (101) leading to the first passive outmost layer (3.2),
- 25 - depositing on the first layer (101), a second layer (102) leading to the active central area (3.1),
- depositing on the second layer (102), a third layer (103) leading to the second passive outmost  
30 layer (3.3),

- delimiting as a column, the three deposited layers to form the stack,
- laterally coating the stack with an electrically insulating confinement material (4), this material leading to confinement.

19. The method according to claim 15, characterized in that the steps b) and c) include the following operations:

- depositing on the first passive outmost layer (3.2), a layer leading to the active central area,
- delimiting the active central area (3.1),
- laterally coating the active central area (3.1) with an electrically insulating material (4), this material leading to confinement,
- making the second passive outmost area (3.3) on the active central area (3.1).